REMARKS

This application has been carefully reviewed in light of the Office Action dated July 29, 2004. Claims 8, 11, 42, and 44 have been amended. Claims 10 and 43 have been canceled. Claims 2-5, 8, 11-1, 42, and 44 are now pending. Applicants reserve the right to pursue the original claims and other claims in this and other applications. Applicants respectfully request reconsideration in light of the Amendments and following remarks.

Claim 8 has been amended to recite a method of "depositing an oxygen-deficient dielectric film . . . over a semiconductor substrate; subjecting the dielectric film to a densifying treatment . . . subjecting said stabilized dielectric film to a wet oxidation with steam process provided by heating a mixture of hydrogen and oxygen gases in a rapid thermal process chamber at a temperature of at least about 450°C, wherein the ratio of hydrogen to oxygen gases in the mixture is in the range of about 0.1 to about 0.8, and wherein the pressure of said rapid thermal process chamber is held at about atmospheric pressure; and subjecting the dielectric film to a second heat treatment." Support is found in Applicants' specification, pg. 6, lines 27-30 and pg. 9, lines 2-3.

Claim 44 has been amended to recite a method of "depositing an oxygen-deficient dielectric film . . . over a semiconductor substrate; subjecting the dielectric film to a densifying treatment . . . subjecting the stabilized dielectric film to a wet oxidation with steam process provided by heating a mixture of hydrogen and oxygen gases in a rapid thermal process chamber at a temperature of at least about 450°C, wherein said hydrogen and oxygen gases are combined in said rapid thermal process chamber and said rapid thermal process chamber has a pressure of around 1 millitorr; and subjecting the dielectric film to a second heat treatment." Support is found in Applicants' specification, pg. 9, lines 3-5.

Claims 42 and 43 stand rejected under 35 U.S.C. § 112, first paragraph as failing to comply with the written description requirement. Claim 42 has been amended to omit claim language reciting that only hydrogen and oxygen are used in the rapid thermal process chamber. Claim 43 has been canceled and the rejection is now moot.

Claims 8, 2-5, 11-12, and 44 stand rejected under 35 USC § 103(a) as being unpatentable over Patel in view of either Emesh or Chivukula, and further in view of Van Zant, and considered with the CRC Handbook. The rejection is respectfully traversed.

The Office Action asserts that Patel discloses forming an oxygen-deficient dielectric film; subjecting the dielectric film to an oxidation in gases like oxygen, ozone, or air; and using rapid thermal annealing in a RTA chamber at a temperature of 650-850°C, for about 5-30 seconds (pg. 4). The Office Action concedes that Patel "does not teach wet oxidation to anneal the ferroelectric PZT layer 14." (pg. 5). The Office Action relies upon Emesh or Chivukula for annealing an oxygen-deficient ferroelectric material with a wet oxidation anneal process comprising water and ozone. The Office Action asserts that the motivation to combine Emesh or Chivukula with Patel is that a ferroelectric film with reduced stress and improved electrical properties would result.

Applicants respectfully submit that the cited references do not teach or suggest Applicants' claimed invention for at least the following reasons: First, the cited references do not disclose or suggest "subjecting the dielectric film to a densifying treatment . . . and [that] the pressure of said rapid thermal process chamber is held at about atmospheric pressure," as recited in claim 8, or "subjecting the dielectric film to a densifying treatment . . . and [that the] hydrogen and oxygen gases are combined in said rapid thermal process chamber and said rapid thermal process chamber has a

pressure of around 1 millitorr," as recited in claim 44; second, there is no motivation to combine the cited references; third, that the motivation to combine only seems obvious in light of Applicants' specification; fourth, that even if the references are combinable, which they are not, Patel's method would undergo a major redesign and reconstruction to accommodate Emesh's or Chivukula's wet oxidation process; and finally, the Office Action has not set forth a *prima facie* case of obviousness.

There is no motivation to combine Patel with Emesh or Chivukula. Patel discloses annealing a ferroelectric layer 14 with ozone. The use of ozone over oxygen allows quicker adsorption of an oxygen atom in a ferroelectric material such as PZT. A high concentration of oxygen atoms are provided by ozone's quick disassociation. The liberated oxygen atoms penetrate quickly into the ferroelectric material; thus, reducing the anneal process time and number of Pb atoms lost. Emesh, in contrast, discloses a wet oxidation method that results in "a reduction of the crystallization temperature of the PZT from ~650°C. to <500°C." (Col. 5, lines 52-54). Applicants note that the 650°C is the same temperature used in Patel. Chivukula discloses a "sol-gel precursor solution for formation of a ferroelectric material," by a wet oxidation process (col. 7, lines 34-35). Chivukula's sol-gel precursor solution decreases "the carbon content in the bulk of the film." (Col. 8, lines 14-16).

All of the references are directed to solving different problems associated with ferroelectric materials by employing different methods. One skilled in the art would not combine the references since each reference is directed to solving a particular problem with a specific anneal process. Patel is directed to a quick anneal process that avoids the loss of Pb atoms from a PZT layer. Emesh is directed to a low temperature anneal process of a PZT layer. Chivukula is directed to decreasing the carbon content in the bulk of a ferroelectric film. The references are directed to solving different

problems with different methods.

The fact that the references have little in common, is further underscored by the varying temperatures and times used to carry out the methods in the respective references. For instance, Patel discloses that at least a temperature of 650°C must be used to disassociate the ozone into O_2 and O-. Specifically, Patel teaches "a temperature in the range of about 650°C. to about 850°C. for about five to thirty seconds." (Col. 4, lines 11-15). Patel utilizes the quick disassociation of ozone, e.g., O_2 and O-, at high temperatures to provide free oxygen atoms that quickly diffuse into ferroelectric material. In other words, Patel teaches a high temperature anneal. An anneal temperature below 650°C is not desirable. Emesh, in contrast, discloses a low temperature anneal. A temperature of "450°C in an annealing atmosphere comprising oxygen in the presence of water vapour for 300 seconds," is taught (Col. 5, lines 19-22). The Examiner even concedes, in the Office Action dated April 16, 2001, that "[a]n objective in Emesh is keep the temperature below 500 C during fabrication to keep the thermal budget low." (pg. 6) (emphasis added).

One skilled in the art would not combine the teachings of a high temperature (Patel, above 650°C) and low temperature anneal process (Emesh, below 500°C). Further, even the length of the anneal processes in Patel and Emesh are different. Patel discloses a 5-30 second anneal process. Emesh discloses a 300 second anneal process. Emesh's anneal process is ten times longer than Patel's. The teachings of Patel and Emesh are in contradiction to each other, e.g., different temperatures and times, and accordingly, teach away from the Examiner's proposed combination.

For similar reasons provided above, one skilled in the art would not combine Patel and Chivukula. Chivukula discloses that "the sol-gel precursor solution provides particular benefits for processing for integrated circuit applications using rapid thermal annealing at relatively low temperatures." (Col. 8, lines 22-25). Patel is a high temperature anneal process. One skilled in the art would not combine a high temperature (Patel) with a low temperature anneal process (Chivukula).

Applicants submit that "[t]he mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." M.P.E.P. § 2143.01 (emphasis added). The prior art is not suggesting the proposed combination; but, rather the claimed invention is the foundation for the combination. As noted above, the references teach away from each other by disclosing processes with different times and temperatures. The proposed combination is improper hindsight reconstruction.

Moreover, even if the references are combinable, which they are not, it is not proper to combine references where doing so "would require a substantial reconstruction and redesign of the elements shown in the primary reference [i.e., Patel] as well as a change in the basic principle under which the primary reference [i.e., Patel] construction was designed to operate." In re Ratti, 270 F.2d 810, 813, 123 U.S.P.Q. 349, 352 (C.C.P.A. 1959). This is well-settled Office policy. See M.P.E.P. § 2143.01, page 2100-127 (Feb. 2003).

The 'modification' proposed by the Examiner, in the rejection of claims 8, 2-5, 11-12, and 44, requires a substantial reconstruction and redesign of Patel's elements, and changes the basic principle under which Patel was designed to operate. For instance, Patel uses an ozone anneal because ozone quickly disassociates at high temperatures, e.g., 650°C and above. Emesh and Chivukula disclose a low temperature

anneal to provide a lower thermal budget. Patel benefits from a higher temperature since less Pb atoms are lost which is the basic principle of Patel's method.

There is also no suggestion or disclosure in Patel that a wet oxidation process could successfully work. In fact, the proposed combination of references suggests that it would not. The proposed combination would lengthen the anneal time by a factor of ten in Patel. This is direct contradiction to Patel's disclosure of quickly annealing the ferroelectric layer to avoid Pb atom loss.

Further still, to establish a *prima facie* case of obviousness, three requirements must be met: (1) some suggestion or motivation, either in the references themselves or in the knowledge of a person of ordinary skill in the art, to modify the reference or combine reference teachings; (2) a reasonable expectation of success; and (3) the prior art reference (or references when combined) must teach or suggest all the claim limitations. More importantly, the teaching or suggestion to make the claimed combination and the reasonable expectation for success must both be found in the prior art and not based on the Applicants' disclosure. See, e.g., In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974).

As mentioned above, there is no teaching or suggestion to make the claimed combination in the prior art. The proposed combination is derived from Applicants' disclosure. One skilled in the art would not have combined the references since a major redesign and reconstruction of Patel's methods would be required. The cited references also do not teach or suggest all of the claimed limitations.

The cited references do not teach or suggest subjecting the dielectric film to a densifying treatment and the pressure of the rapid thermal process chamber is held at about atmospheric pressure, or about 1 millitorr. Accordingly, the Office Action has not set forth a *prima facie* case of obviousness for at least the reasons provided above.

The Office Action relies on Van Zant to teach the use of a mixture of hydrogen and oxygen to provide steam, and does not rectify the deficiencies associated with Patel, Emesh, and Chivukula. Claims 2-5 and 11-12 depend from claim 8 and should be similarly allowable along with claim 8.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

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Respectfully submitted,

By____________________

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